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Diabetes UK evidence-based nutrition guidelines for the prevention and management of diabetes.

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Abstract

A summary of the latest evidence-based nutrition guidelines for the prevention and management of diabetes are presented. These guidelines are based upon existing recommendations last published in 2011 and were formulated by an expert panel of specialist dietitians following a literature review of recent evidence. Recommendations have been made in terms of foods rather than nutrients wherever possible. Guidelines for education and care delivery, prevention of Type 2 diabetes, glycaemic control for Type 1 and Type 2 diabetes, cardiovascular risk management, management of diabetes-related complications, other considerations including co-morbidities, nutrition support, pregnancy and lactation, eating disorders, micronutrients, food supplements, functional foods, commercial diabetic foods and nutritive and non-nutritive sweeteners are included. The sections on pregnancy and prevention of Type 2 diabetes have been enlarged and the weight management section modified to include considerations of remission of Type 2 diabetes. A section evaluating detailed considerations in ethnic minorities has been included as a new topic. The guidelines were graded using adapted GRADE methodology and where strong evidence was lacking, grading was not allocated. These 2018 guidelines emphasise a flexible, individualised approach to diabetes management and weight loss and highlight the emerging evidence for remission of Type 2 diabetes. The full guideline document is available at: insert link here

Novelty Statement

- These up-dated guidelines, based on recently published studies, provide evidence-based recommendations for the prevention and management of diabetes
- The focus is on food, rather than nutrients, and an individualised, flexible approach to nutritional management is recommended
- New guidelines for remission of Type 2 diabetes and considerations for ethnic minorities are included
- Guidelines are assessed using adapted GRADE methodology

Introduction

‘An appropriate diet represents the cornerstone for diabetes therapy, and there is now unequivocal evidence that type 2 diabetes can be delayed or prevented by a well-structured diet and increased physical activity, generally resulting in weight loss’

[1]. Most experts now agree that diet has an increasingly important part to play in both the management and prevention of diabetes, with emerging evidence suggesting potential remission of Type 2 diabetes. However, there remains little consensus about the constituents of an ideal or optimal diet, and current evidence suggests that various dietary patterns can be effective [2]. Diabetes UK reflected these conclusions in their evidence-based nutrition guidelines for diabetes, last published in 2011 [3] and, as the evidence remains fully supportive of these findings, those guidelines were used as the basis for these new recommendations.

One criticism that is frequently levelled at new recommendations is that they may contradict previous guidance, and this leads to a level of distrust. It is worth remembering that nutrition is a relatively young and complex science, with a large amount of emerging evidence, and these new recommendations attempt to establish the current evidence base for guidance and, in so doing, may well contradict traditional beliefs and usual practice. Key features of the new guidelines were to try to move from recommendations for individual nutrients to foods that meet the needs of people with diabetes, and to make the new guidelines more accessible and usable by the individuals and groups for whom they are designed. Formulating evidence-based recommendations from the available literature can be challenging for a variety of reasons, including quality, type of intervention, analysis and application of dietary studies.

Quality of studies

Many different strategies are used to assess the effects of different diets and foods on health outcomes, including randomised controlled trials (RCT), intervention studies with no comparator group, prospective cohort studies, cross-sectional cohort studies and case reports. RCTs are widely regarded as the gold standard, but are often impractical or limited when assessing nutritional outcomes which are influenced by many factors that are difficult to control, and where outcomes of interest are far in the future and it would be impossible to follow up individuals for many decades. For this reason, well conducted, large, prospective cohort studies supply useful data for evaluating the relationship between dietary patterns and individual foods and diabetes-related outcomes and are widely used to inform these new guidelines.

Type of intervention – foods or nutrients.

Traditionally, intervention studies in people with diabetes have focused on specific nutrients e.g. carbohydrate and fat, but there is a global movement towards more food-based guidelines [4]. Recommendations from dietary studies can be formulated in terms of dietary patterns, foods or specific nutrients, and the 2018

recommendations highlight the importance of foods rather than nutrients wherever possible.

Analysis

Dietary intervention studies frequently report contradictory results and this has been highlighted recently with meta-analyses reporting conflicting outcomes regarding the role of saturated fat in cardiovascular disease and the effect of low carbohydrate diets on glycaemic control when compared with other dietary strategies. This is compounded by the binary nature of such intervention studies, which typically assess the efficacy of two very different diets, whereas populations eat more varied diets. The applicability of meta-analyses, which are intended for the aggregation of similar studies [5], is questionable for dietary studies where there is considerable heterogeneity resulting from differences in type, duration and intensity of the intervention, differences in comparator diets and variation in the participants including duration of diabetes and medication use.

Application

Applying and evaluating intervention diets used in dietary studies is challenging. There are few readily available biomarkers to assess adherence, and often the only measure used is self-reported dietary intake. This measure is notoriously unreliable and it has long been known that under-reporting, especially in those who are obese, is common [6]. As a result, it is challenging to establish a causal relationship between the individual components of study diets and their reported effects, and to formulate specific guidelines for free-living populations.

The above limitations were all considered when formulating the new recommendations, and the following article summarises the Diabetes UK 2018 evidence-based nutrition guidelines for the prevention and management of diabetes in adults. The full document is available from (insert link here).

Methods

In 2016, Diabetes UK appointed an expert Nutrition Sub-Committee to review and update the existing 2011 nutrition guidelines [3]. These previous guidelines had included studies published up to August 2010, and the current guidelines incorporated this existing evidence together with additional studies published between January 2010 and December 2016. In addition, key publications of meta-analyses and systematic reviews up to July 2017 were included, and an exception was made to include a major study of diabetes remission published in December 2017 [7].

The committee made the decision to retain previous sections including education and care delivery, prevention of Type 2 diabetes, glycaemic control for Type 1 and Type 2 diabetes, cardiovascular risk management, management of diabetes-related complications, other considerations such as co-morbidities, nutrition support, pregnancy and lactation, eating disorders, micronutrients, food supplements, functional foods, commercial diabetic foods and nutritive and non-nutritive sweeteners. The sections on pregnancy and prevention of Type 2 diabetes were enlarged and the weight management section was modified to include remission of Type 2 diabetes in response to current interest in emerging data. A section evaluating detailed considerations in ethnic minorities was included as a new topic.

Relevant studies were identified by electronic searches in EMBASE, MEDLINE and the Cochrane Central Register of Controlled Trials. Reference lists of selected papers were then investigated for any further studies suitable for consideration. Existing guidelines were identified from local, national and international reports. Search terms and keywords for each section were defined and agreed by the committee. Inclusion criteria for studies were adults (aged over 18 years) with Type 1 or Type 2 diabetes. Randomised controlled trials, intervention studies and prospective cohort studies, all with a dietary or lifestyle component, were included.

Formal meta-analyses of dietary interventions for diabetes were not undertaken because it was not deemed a valid approach. The majority of studies were at high risk of bias and heterogeneous in terms of study design, type and intensity of the intervention, the comparator diet or intervention, study length, duration of diabetes and medication use.

The GRADE system (Grades of Recommendation Assessment, Development and Evaluation), a systematic approach to making judgements about the quality of evidence and strength of recommendations, was used as the basis for grading these dietary recommendations [8]. GRADE was employed in these guidelines as it is a system widely used for nutritional recommendations and has been adopted globally by about one hundred organisations that are responsible for formulating recommendations to support healthcare decision-making [9]. GRADE also encourages a focus on the recommendations that are of primary importance for people with diabetes, and which are worded in manner that are more person-focused and emphasise eating behaviour and diabetes. It is acknowledged that much of the evidence from nutrition research is derived from prospective cohort studies rather than RCTs, and applying GRADE downgrades evidence from prospective studies when compared to RCTs, and this should be borne in mind when considering the grading allocated to each recommendation.

The final guidelines underwent internal review by all members of the committee, and were then submitted to external peer review by three experts in the field. They were subsequently reviewed by Diabetes UK's Council of People with Diabetes, Diabetes UK's Council of Healthcare Professionals, British Dietetic Association's Diabetes Specialist Group, Association of British Clinical Diabetologists, Primary Care Diabetes Society, Royal College of Nursing and Royal College of GPs.

Summary of guidelines with evidence GRADE

An overview of the guidelines are provide below. The evidence GRADE is marked by a number from 1-4, where a higher number denotes stronger evidence and lower numbers indicate deductions made for lower-quality studies with limited generalisabilty, see below:

- **Grade 4**: strong recommendation based on high quality evidence
- **Grade 3**: moderate recommendation based on moderate quality evidence
- **Grade 2**: low strength recommendation based on low quality evidence
- **Grade 1** (or less): very low strength recommendation based on very low quality evidence

Not Rated (NR): A key aspect of current approaches to supporting people with diabetes is to encourage practice that is individualised. It is challenging to rate such recommendations using the GRADE system, particularly in situations where multiple conditions influence health and dietary approaches. In response to this, a deliberate decision was made to report these recommendations as 'Not Rated', indicated by the letters NR.

The references to the evidence linked to the following recommendations can be found in the full document (insert link)

Nutrition Management and Models of Education and Care Delivery

• Nutrition management is recommended as part of an integrated package of education and clinical care for all people with diabetes and those at risk of developing Type 2 diabetes	**4**
• Offer on-going nutritional advice guided by a registered dietitian to all people with diabetes, and those at high risk of Type 2 diabetes	**3**
• Offer structured diabetes education at the time of diagnosis with annual follow-up	**3**
• Offer culturally sensitive multi-component education and interventions to people from ethnic minority groups	**4**
• Adopt a person-centred approach and a variety of learning styles during education	**NR**

Prevention of Type 2 Diabetes

- Aim for weight loss of at least 5%, where appropriate, to reduce the risk of Type 2 diabetes in high risk groups **4**
- Key recommendations for lifestyle interventions to reduce risk of Type 2 diabetes in high risk groups include:
  - Restrict energy intake **4**
  - Reduce total and saturated fat intake
  - Increase fibre intake
  - Increase physical activity
- Dietary patterns associated with reduced risk in general populations include:
  - Mediterranean diet **4**
  - DASH diet **2**
  - Vegetarian and vegan diets **2**
  - The Nordic healthy diet **2**
  - Moderate carbohydrate restriction **1**
- Include more specific foods associated with reduced risk in general populations such as wholegrains, some fruit, green leafy vegetables, yogurt and cheese, tea and coffee **2**
- Reduce specific foods associated with increased risk in general populations including red and processed meat, potatoes, particularly French fries, sugar sweetened beverages and refined carbohydrates **2**
- Offer culturally tailored, multi-component lifestyle interventions to reduce the risk of Type 2 diabetes in ethnic minority groups **3**

Weight management and remission of Type 2 diabetes

- For overweight or obese people with Type 2 diabetes:
  - For Type 2 diabetes remission, aim for weight loss of at least 15 Kg, as soon as possible after diagnosis **3**
  - To improve glycaemic control and CVD risk aim for at least 5% weight loss achieved by reducing calorie (energy) intake and increasing energy expenditure **4**
- Adopt an individualised approach which may include dietary, physical activity, surgical and medical stratagies that are recommended for people without diabetes **NR**

Glycaemic control and Type 1 diabetes

- Offer education to support people with Type 1 diabetes to identify and quantify their dietary carbohydrate intake for glycaemic control. Specifically:
  - Adjust insulin to carbohydrate intake in people using multiple daily injections (MDI) and continuous **4**

subcutaneous insulin infusion (CSII) (insulin pump)
    - Aim for consistent quantities of carbohydrates on a day-to-day basis in people on fixed insulin regimens **1**

Glycaemic control and Type 2 diabetes

- Prioritise sustained weight loss of at least 5% in overweight people by reducing calorie (energy) intake and increasing energy expenditure **4**
- Aim for a Mediterranean-style diet or equivalent healthy eating pattern. (See CVD section) **4**
- Offer individualised education to support people to identify and quantify their dietary carbohydrate intake, encourage low glycaemic index (GI) foods and consider reducing the total amount of carbohydrates **NR**
- Aim for at least 150 mins per week of moderate to vigorous physical activity, over at least 3 days **4**

Cardiovascular disease risk reduction: blood lipids and blood pressure

- Dietary patterns, specifically the Mediterranean and DASH-style diets, are recommended to reduce CVD risk factors and CVD events in people with diabetes. Key features of these diets include:
    - Decrease salt intake (<6g/day)
    - Eat 2 portions of oily fish each week
    - Eat more wholegrains, fruit and vegetables, fish, nuts and legumes (pulses) **3**
    - Eat less red and processed meat, refined carbohydrates and sugar sweetened beverages
    - Replace saturated fats (SFA) with unsaturated fats, and limit intakes of trans fatty acids (TFA)
    - Limit alcohol intake to ≤14 units a week
- Aim for modest weight loss of at least 5% in overweight individuals **3**
- Aim for at least 150 mins per week of moderate to vigorous physical activity, over at least 3 days **4**
- Products containing 2-3g of plant stanols and sterols per day can be recommended **3**

Considerations in ethnic minority groups

Evidence reviewed in this section informed the recommendations for ethnic considerations in other sections such as prevention of Type 2 diabetes, and models of education and care delivery (see above sections)

Nutritional management of diabetes complications

Hypoglycaemia

- An individualised approach to hypoglycaemia management with appropriate monitoring is recommended. One example of a strategy commonly recommended is: **NR**
    - Take 15–20g glucose
    - Repeat treatment if blood glucose level has not risen above 4mmol/L after 15 minutes
    - Depending on individual needs and treatment, a follow-up snack providing 15–20g carbohydrate may be necessary

Diabetic nephropathy

- Offer individualised approach to minimise risk of malnutrition **NR**
    - Provide advice on potassium, phosphate, salt and energy intake as clinically required
    - Do not routinely restrict protein intake

Lower limb ulcers and amputation

- Assess nutritional status and offer individualised approach to minimise malnutrition, and optimise glycaemic control **NR**

Diabetic gastroparesis

- Offer individualised care to meet nutritional requirements, manage symptoms and optimise glycaemic control **NR**

Recommendations for dietary management of people with diabetes and existing CVD are similar to those for people with diabetes without established CVD (see CVD risk reduction section above) so these were not repeated. There was lack of published evidence to make evidence-based recommendations for the specific role of diet in the management of other diabetes complications including retinopathy and diabetic ketoacidosis.

Other special considerations

Nutrition support

- Aim to meet nutritional requirements and adequacy **2**
    - Adjust diabetes treatment to optimise glycaemic control
    - Deliver support from a multi-disciplinary team
- General enhanced recovery after surgery protocols can be recommended, depending on individual clinical situation **NR**
- Diabetes specific formulae enteral feeds can be recommended, but are not routinely used in the UK **2**

Older person

- Offer education, including dietary intervention, to older people with diabetes. Age should not restrict access to education **4**
- Assess nutritional status and care plans under the supervision of a dietitian **NR**
- Adapt general guidelines for people with diabetes for those with dementia **NR**

Diabetes care in institutions

- Offer access to education, including dietary intervention, to people in institutions **NR**
- Provide menus with nutritional information, including carbohydrate content **1**

Pregnancy

Women living with diabetes (both Type 1 and Type 2 diabetes) prior to conception should : **NR**

- Receive support from a multidisciplinary team, including referral to a dietitian
- Aim to achieve and maintain optimal glycaemic control before and during pregnancy
- Aim to lose weight before pregnancy if overweight or obese and maintain appropriate weight gain during pregnancy
- Take 5mg folic acid/day before pregnancy until the end of the 12th week of pregnancy

Women diagnosed with gestational diabetes should: **NR**

- Be referred to a dietitian for dietary advice
- Aim to achieve appropriate weight gain
- Take regular physical activity, including walking for 30 minutes after a meal to lower postprandial glucose concentrations

Coeliac disease

- Offer individualised advice by a specialist dietitian to all people with coeliac disease and diabetes **NR**
- Recommend adherence to a gluten free diet **4**

Cystic fibrosis related diabetes mellitus

- Provide individualised dietary and insulin education and advice to optimise nutritional status, weight and glycaemic control **NR**

- Avoid unnecessary dietary energy restrictions **1**
- Provide education to support people to identify and quantify carbohydrates to manage glycaemic control, including during supplementary feeding **1**

Diabetes in HIV

- Offer individualised multi-component interventions to treat antiretroviral-associated weight gain to reduce risk of Type 2 diabetes **NR**
- Follow diet and physical activity recommendations for the general diabetes population to manage diabetes in people with HIV **NR**

Eating disorders

- Consider the possibility of disordered eating or other control behaviours relating to food in adults with diabetes **NR**
- Use suitable screening tools to identify possible eating disorders at the earliest opportunity **2**
- Consider an early referral to local eating disorder services **NR**

Micronutrients, food supplements and functional foods

- Do not recommend micronutrient supplementation to manage or prevent diabetes **4**
- Encourage individuals choosing to use supplements to discuss their individual needs with a registered dietitian **NR**

Commercial diabetic foods, sugars and other sweeteners

- Avoid food labelled ‘diabetic’ or ‘suitable for diabetics’ **NR**
- Reduce intake of free sugars, sugar-sweetened beverages and added fructose **2**
- Non-nutritive (artificial) sweeteners are safe and may be recommended **NR**

Conclusions

The 2018 recommendations for adults with diabetes or at risk of Type 2 diabetes are based on current evidence, and worded to encourage accessibility by people with diabetes, the general public and healthcare professionals. These recommendations should form the basis for dietary management of adults with diabetes and those at risk of Type 2 diabetes in the UK. They should be adapted to suit an individual's culture, preferences, needs and personal goals. Diabetes UK commits to regular review of emerging evidence and to update the 2018 recommendations as appropriate.

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